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Geology and Soil Resources Report

South Fork Tributary Habitat Enhancement Project

Salmon/Scott River Ranger District, Klamath National Forest
Siskiyou County, California

For Information Contact: William Randy Lew
Associate Geologist, PG # 7872
Pacific Watershed Associates, Inc
randyl@pacificwatershed.com

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Geology and Soil Resources Report

Introduction

The purpose of this report is to evaluate the effects to geologic hazards and soil resources from the South Fork Tributary Habitat Enhancement Project on the Salmon/Scott River Ranger District of the Klamath National Forest. The Klamath National Forest's Land and Resource Management Plan (Forest Plan) Standards and Guidelines for soils resources (USDA, Forest Service page 4-20) includes the need to maintain soil productivity, soil cover and minimize soil erosion during and after project implementation. The Forest Plan also requires a geologic evaluation be completed for all ground disturbing activities. The Asbestos Air Toxic Control Measures for Construction, Grading, Quarrying and Surface Mining Operations (CARB, 2002) require that before construction be implemented an assessment for the potential for naturally occurring asbestos be completed.

Methodology

Analysis Indicators and Measures

- Potential for the project to cause hillslope instability
    - This will be measured by determining how likely the project is to change the mass balance of the hillslope, specifically undercutting any toe zones or inner gorges.
- Potential for naturally occurring asbestos to be disturbed
    - This will be measured by determining if any ultramafic bedrock will be disturbed during the project implementation.
- The functioning category of soil productivity in the project area
    - This will be measured by determining the effects of the project on soil stability, organic matter, soil strength and moisture regimes. Properly functioning soil productivity includes adequate soil cover to minimize erosion. The area should have a wide range of sizes of organic matter on the surface and in the upper layer of the soil. The soil should be strong enough to securely anchor roots and remain relatively un-compacted. It should have a moisture regime consistent with which the soil was developed (USDA Forest Service, 2012).

Spatial and Temporal Bounding of Analysis Area

The spatial analysis boundary will be the project area because this is the extent that effects are likely to be noticeable for the indicators defined above. The temporal bounds for cumulative effects will be four to five years for the hillslope instability and soil productivity. This is about how long we will see an increase in soil erosion as well as how long it will likely take for any changes in hillslope mass balance to become apparent (likely during a 2-10 year storm event). The temporal bounds for the naturally occurring asbestos analysis is during construction only. Dust generated during construction will settle within a few hours of cessation of work.

Affected Environment

The project area is on the margins of the active channel and floodplain bar of both Methodist and Knownothing Creeks. These areas have been actively placer mined in the past, which has left behind a mix of natural and man-made landforms including placer tailing piles strewn throughout the natural floodplain terraces adjacent to the active channel(s). According to published geologic mapping of the area there is no ultramafic bedrock underlying the Knownothing Creek project area. However, published mapping does show serpentinite bedrock exposures near the Methodist Creek Project area (Ernst, 1998).

The soil types vary within the different project areas. For the Knownothing Creek project area soil types include:

1) Well drained gravely loam in the Holland-Aiken family. These soils have a moderate erosion hazard rating meaning that during active management erosion will be noticeable within storms that have just above average precipitation (3-5 year storm event). However, the soil has a low tendency toward rilling or gullying. Sheet wash is the most likely process of erosion for this soil and landform, so maintaining sufficient vegetative and soil cover can minimize erosion.

2) Well drained very gravely loam in the Lithic Haploxeralfs-Holland family and Skalan family-Lithic Haploxeralfs association. These soils have a severe erosion hazard rating primarily because of the increased slope class. During active management erosion will be noticeable within storms that have average precipitation (1-2 year storm event). Soil loss can occur through rilling, gullying or sheetwash, so maintaining sufficient vegetative and soil cover can minimize erosion.

For the Methodist Creek project area soil types include:

1) Well drained very gravely loam in the Clallam, deep-Holland family. These soils have a severe erosion hazard rating primarily because of the increased slope class. During active management erosion will be noticeable within storms that have average precipitation (1-2 year storm event). Soil loss can occur through rilling, gullying or sheetwash, so maintaining sufficient vegetative and soil cover can minimize erosion.

2) Well drained gravely sandy loam in the Clallam family, very deep-Riverwash association. These soils have a "non-rated" erosion hazard rating but based on field characterization should be considered a moderate erosion hazard rating due to relative low gradient slopes (0-15%) and coarse alluvial soils. During active management erosion will be noticeable within storms that have just above average precipitation (3-5 year storm event). However, the soil has a low tendency toward rilling or gullying. Sheet wash is the most likely process of erosion for this soil and landform, so maintaining sufficient vegetative and soil cover can minimize erosion.

3) Well drained gravely sandy clay loam in the Kang-Beaughton families. These soils have a severe erosion hazard rating primarily because of the increased slope class. During active management erosion will be noticeable within storms that have average precipitation (1-2 year storm event). Soil loss can occur through rilling, gullying or sheetwash, so maintaining sufficient vegetative and soil cover can minimize erosion.

Currently, in the Knownothing and Methodist Creek project areas the soils are properly functioning for soil productivity in the river bar environment.

Environmental Consequences

Alternative 1 – No Action

Direct Effects and Indirect Effects

There would be no action taken in the No Action Alternative so there is no effect to geologic or soils resources.

Cumulative Effects

There are no direct or indirect effects as a result the No Action Alternative so there are no cumulative effects.

Alternative 2

Direct and Indirect Effects

The work proposed is on gentle, relatively stable landforms (alluvial floodplain terraces and adjacent stream banks) for the project area. Steep, inner-gorge hillslopes are outside of the project area and will not be affected by the project activities. The placement of large woody debris materials along the streambanks will not undercut any sensitive landforms and won't change the mass balance of the hillslope. The proposed action is not likely to increase hillslope instability.

There is no ultramafic bedrock within or near the Knownothing Creek project area. There is ultramafic bedrock on exposed road cutbanks and hillslopes near the Methodist Creek project area. However, these ultramafic rocks will not be disturbed as a result of this project. Access to the individual sites is entirely on alluvial materials and no excavation or disturbance will occur within ultramafic rocks during large woody debris placement. Therefore, the probability of disturbing naturally occurring asbestos is very low.

The heavy machinery will cause a small amount of soil compaction in the project area. This will be mitigated by strategic use of heavy equipment. For instance, the implementation team will utilize only designated access ramps and staging areas during construction and will minimize any disturbance outside this given work area. In addition, the heavy equipment utilized (i.e., excavator, bulldozer) will rip and/or scarify the post implementation access routes as needed to mitigate for any soil compaction. The gravelly loam soils throughout this area have relatively high soil strength which implies a moderate soil compaction hazard rating. The work will be completed when the soil moisture is low (summer/fall) and compaction is least likely. There may be some localized compaction but it will be on the short-term and once vegetation is re-established it will be broken up. The degree and extent of soil compaction in the project area will not impact plant growth, risk of erosion, or soil hydrologic function. The soil areas will not have measurable soil compaction over the long-term.

Where soil and vegetation are disturbed by construction activities (equipment access, storage areas and placement of large woody debris) water is more likely to erode soils, however the incremental area of ground disturbance for the project is less than 1.4 acres. These short-term impacts will be reduced by working during dry conditions, minimizing vegetative disturbance, and placing erosion controls prior to and during construction, including permanent soil stabilization immediately following construction.

The soils outside of the areas described above will remain undisturbed and the soil cover will not be reduced. Soil cover will be maintained or enhanced by stabilizing and re-vegetating disturbed areas with native vegetation. Certified weed-free straw, mulch, or other soil erosion measures will also be used as needed to temporarily stabilize the disturbed areas until vegetation can be established. This will keep the post-implementation soil cover and organic matter in the disturbed areas at desired conditions that will meet the Forest Plan standards and guidelines (Forest Plan, Standard and Guides 3-2, page 4-20). The project area will continue to be in the properly functioning category for soil productivity.

In addition to the small project scale, standard permit requirements, Project Design Features (PDFs), and Best Management Practices (BMPs, Appendix B) are integrated into the proposed action. Such water quality protections include:

- PDF WS-1 - Access routes will be stabilized, if necessary, immediately following implementation and completed by November 1st, or the first significant rainfall, whichever comes first. Implementation will begin after July 9th. Ground disturbing activities will also be restricted during periods of wet weather during the Normal Operating Season.
- PDF WS-2 - Mulch and/or seed areas disturbed by restoration activities where sufficient levels of soil cover are lacking.
- PDF WS-3 - Erosion control and other requirements to protect water quality are described in BMPs, (Appendix B). If "conditions arise or change in such a manner as to be considered deleterious to aquatic life, operations shall cease until corrective measures are taken" by CDFW.
- Shrub, and tree removal to allow equipment access/operation will result in the least possible loss of vegetation
- Work will be conducted during low flow conditions, with the minimal equipment necessary to implement the project.
- All structure implementation and work along the stream channel will be completed by October 15th, avoiding winter weather working conditions.

Cumulative Effects

The other current or reasonably foreseeable projects in the project area do not directly overlap with the areas of disturbance for this project so there are no cumulative effects for soil resources. There are no effects to geologic resources so there are no cumulative effects.

Summary of Effects

The project will not increase the hillslope instability or disturb any ultramafic bedrock during construction. The soil productivity will remain in the properly functioning category because of project design features.

Table 1: Comparison of the effects of the alternatives for each indicator.

Indicator	No Action Alternative	Proposed Action
Potential for Hillslope Instability	There is no change to hillslope stability.	There is no change to hillslope stability.
Potential for disturbance of Naturally Occurring Asbestos	There is no disturbance of ultramafic bedrock.	There is no disturbance of ultramafic bedrock.
Functioning Category for Soil Productivity	The soil will remain in a properly functioning category.	The soil will remain in a properly functioning category.

Compliance with law, regulation, policy, and the Forest Plan

This project complies with USFS direction in Forest Service Manual 2550 (Soil Management) (USDA Forest Service, 2012) and the Forest Plan standards and guidelines (USDA Forest Service, 2010). The project is also in compliance with the Asbestos Air Toxic Control Measures (CARB, 2002).

Literature Cited

(CARB) California Air Resources Board. 2002. Asbestos ATCM for Construction, Grading, Quarrying, and Surface Mining Operations. Order 2002-07-29. Retrieved from http://www.arb.ca.gov/toxics/atcm/asb2atcm.htm on January 28, 2016.

Ernst, W.G., 1998, DMG Map Sheet 47, Geology of the Sawyers Bar area, Klamath Mountains, Northern California, scale 1:48,000

USDA Forest Service, 2010. Klamath National Forest's Land and Resource Management Plan, Chapter 4. USDA-Forest Service, PSW Region, Klamath National Forest, Yreka, California.

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Report Summary

Methodology

Analysis Indicators and Measures

- Potential for the project to cause hillslope instability will be measured by determining how likely the project is to change the mass balance of the hillslope.
- Potential for naturally occurring asbestos.
- The functioning category of soil productivity in the project area will be measured by determining the effects of the project on soil stability, organic matter, soil strength and moisture regimes.

Spatial and Temporal Bounding of Analysis Area

The spatial analysis boundary will be the project area because this is the extent that effects are likely to be noticeable for the indicators defined above. The temporal bounds for cumulative effects will be four to five years for the hillslope instability and soil productivity. The temporal bounds for the naturally occurring asbestos analysis is during construction only.

Affected Environment

The project area is on the margins of the active channel and floodplain bar of both Methodist and Knownothing Creeks, which been actively placer mined in the past, which has left behind a mix of natural and man-made landforms including placer tailing piles strewn throughout the natural floodplain terraces adjacent to the active channel(s). There is no ultramafic bedrock underlying the Knownothing Creek project area. However, there is serpentinite bedrock exposures near the Methodist Creek Project area (Ernst, 1998).

The soil type vary within the different project areas. For the Knownothing Creek project area soil types include:

1) Well drained gravely loam in the Holland-Aiken family. These soils have a moderate erosion hazard rating, low tendency toward rilling or gullying, and moderate sheetwash potential.

2) Well drained very gravely loams in the Lithic Haploxeralfs-Holland family and Skalan family-Lithic Haploxeralfs association. These soils have a severe erosion due to slope, and erosion can occur through rilling, gullying or sheetwash.

For the Methodist Creek project area soil types include:

1) Well drained very gravely loam in the Clallam, deep-Holland family. These soils have a severe erosion hazard rating due to slope, and erosion can occur through rilling, gullying or sheetwash.

2) Well drained gravely sandy loam in the Clallam family, very deep-Riverwash association. These soils a moderate erosion hazard, and low tendency toward rilling or gullying, with moderate sheetwash potential.

3) Well drained gravely sandy clay loam in the Kang-Beaughton families. These soils have a severe erosion hazard rating due to slope, erosion can occur through rilling, gullying or sheetwash.

Currently, in the Knownothing and Methodist Creek project areas the soils are properly functioning for soil productivity in the river bar environment.

Environmental Consequences

No Action Alternative

Direct Effects and Indirect Effects

There would be no action taken in the No Action Alternative so there is no effect to geologic or soils resources.

Cumulative Effects

There are no direct or indirect effects as a result of the No Action Alternative so there are no cumulative effects.

Proposed Action

Direct Effects and Indirect Effects

The work proposed is on gentle, relatively stable landforms (alluvial floodplain terraces and adjacent stream banks) for the project area and therefore, the proposed action is not likely to increase hillslope instability.

There is no ultramafic bedrock within or near the Knownothing Creek project area. There is ultramafic bedrock on exposed road cutbanks and hillslopes near the Methodist Creek project area. However, these ultramafic rocks will not be disturbed as a result of this project. Therefore, the probability of disturbing naturally occurring asbestos is very low.

Heavy machinery will cause a small amount of soil compaction in the project area. This will be mitigated by strategic use of heavy equipment, minimizing the footprint of the project, and de-compacting soils following construction. There may be some localized compaction in the short-term, but once vegetation is re-established soils will be fully functional.

Where soil and vegetation are disturbed by construction activities water is more likely to erode soils, however the incremental area of ground disturbance for the project is less than 1.4 acres. These short-term impacts will be reduced by working during dry conditions, minimizing vegetative disturbance, and placing erosion controls prior to and during construction, including permanent soil stabilization immediately following construction.

Soil cover will be maintained or enhanced by stabilizing and re-vegetating disturbed areas with native vegetation. Certified weed-free straw, mulch or other soil erosion measures will also be used as needed to temporarily stabilize the disturbed areas until vegetation can be established. This will keep the post-implementation soil cover and organic matter in the disturbed areas at desired conditions that will meet the Forest Plan standards and guidelines (Forest Plan, Standard and Guides 3-2, page 4-20). The project area will continue to be in the properly functioning category for soil productivity.

In addition to the small project scale, standard permit requirements, Project Design Features (PDFs), and Best Management Practices (BMPs, Appendix B) are integrated into the proposed action.

Cumulative Effects

The other current or reasonably foreseeable projects in the project area do not directly overlap with the areas of disturbance for this project so there are no cumulative effects for soils resources. There are no effects to geologic resources so there are no cumulative effects.

Compliance with law, regulation, policy, and the Forest Plan

This project complies with USFS direction in Forest Service Manual 2550 (Soil Management) (USDA Forest Service, 2012) and the Forest Plan standards and guidelines (USDA Forest Service, 2010). The project is also in compliance with the Asbestos Air Toxic Control Measures (CARB, 2002).